IN THE CLAIMS:

The following listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. *(Currently Amended)* A three dimensional inspection method for inspecting ball grid array devices having a plurality of balls, wherein the ball grid array device is positioned in an optical system, the inspection method ~~comprising the steps of:~~ comprising:

~~a)~~ illuminating at least one ball on the ball array device using a fixed illumination system;

~~b)~~ disposing a single sensor, a first optical element and a second optical element in relation to the ball grid array device so that the sensor obtains at least two differing views of the at least one ball, the sensor providing ~~an~~ output representing the at least two differing views; and

~~c)~~ processing the output using a triangulation method to calculate a three dimensional position of the at least one ball with reference to a pre-calculated calibration plane.

2. *(Original)* The three dimensional inspection method of claim 1 wherein the pre-calculated calibration plane comprises a coordinate system having X, Y and Z axes and wherein an X measurement value is proportional to a Z measurement value.

3. *(Original)* The three dimensional inspection method of claim 1 wherein the pre-calculated calibration plane comprises a coordinate system having X, Y and Z axes and wherein an XY measurement value is proportional to a Z measurement value.

4. *(Original)* The three dimensional inspection method of claim 1 wherein the pre-calculated calibration plane comprises a coordinate system having X, Y and Z axes and wherein a Y measurement value is proportional to a Z measurement value.

5. *(Original)* The three dimensional inspection method of claim 1 wherein the triangulation method is based on determining a center of the ball in a first view and determining a ball top location in a second view.

6. *(Original)* The three dimensional inspection method of claim 1 wherein the pre-calculated calibration plane is defined by measuring a calibration pattern.

7. *(Original)* The three dimensional inspection method of claim 1 wherein the second optical element comprises a mirror.

8. *(Original)* The three dimensional inspection method of claim 1 wherein the second optical element comprises a prism.

9. *(Original)* The three dimensional inspection method of

claim 1 wherein one of the at least two differing views is obtained at a low angle of view.

10. *(Original)* The three dimensional inspection method of claim 1 wherein the sensor and the second optical element are positioned to receive light from different angles relative to the calibration plane.

11. *(Original)* The three dimensional inspection method of claim 1 wherein the sensor comprises a charged coupled device array.

12. *(Original)* The three dimensional inspection method of claim 1 wherein the sensor comprises a complementary metal oxide semiconductor device array.

13. *(Currently Amended)* The three dimensional inspection method of claim 1 wherein the processing ~~step further~~ includes ~~the step of~~ applying grayscale edge detection to locate ball positions.

14. *(Currently Amended)* The three dimensional inspection method of claim 1 wherein the processing ~~step further~~ includes ~~the step of~~ applying threshold analysis.

15. *(Original)* The three dimensional inspection method of

claim 1 wherein the first optical element comprises a lens.

16. *(Original)* The three dimensional inspection method of claim 1 wherein the first optical element comprises a pin-hole lens.

17. *(Original)* The three dimensional inspection method of claim 1 wherein the first optical element comprises a plurality of lens elements.

18. *(Original)* The three dimensional inspection method of claim 1 wherein the first optical element comprises a telecentric lens.

Claim 19 *(Canceled)*

20. *(Currently Amended)* The three dimensional inspection method of claim 1 wherein the ball grid array devices comprise bump on wafer devices.

21. *(Currently Amended)* The three dimensional inspection method of claim 1 wherein ~~the step of~~ processing the output is carried out on a personal computer.

22. *(Original)* The three dimensional inspection method of claim 1 wherein the sensor includes a solid state sensor array.

23. *(Original)* The three dimensional inspection method of claim 1 wherein one of the views comprises a segment having a crescent shape.

24. *(Currently Amended)* A three dimensional inspection method for ball grid array devices having a plurality of balls, the method ~~comprising the steps of:~~ comprising:

~~a)~~ illuminating the ball array device using a fixed illumination system;

~~b)~~ disposing a single sensor to receive light at a first angle relative to the ball grid array device;

~~c)~~ positioning a first optical element to transmit light to the sensor, where the sensor obtains a first view of the ball grid array device;

~~d)~~ disposing a second optical element to receive light at a second angle different from the first angle and to transmit a second view of the ball grid array device to the sensor;

~~e)~~ transmitting image information from the sensor; and

~~f)~~ processing the image information by applying triangulation calculations to measurements of the image information so as to calculate a three dimensional position of at least one ball with reference to a pre-calculated calibration plane.

25. *(Original)* The three dimensional inspection method of claim 24 wherein the calibration plane comprises a coordinate system having X, Y and Z axes and wherein an X measurement value is proportional to a Z measurement value.

26. *(Original)* The three dimensional inspection method of claim 24 wherein the calibration plane comprises a coordinate system having X, Y and Z axes and wherein an XY measurement value is proportional to a Z measurement value.

27. *(Original)* The three dimensional inspection method of claim 24 wherein the calibration plane comprises a coordinate system having X, Y and Z axes and wherein a Y measurement value is proportional to a Z measurement value.

28. *(Original)* The three dimensional inspection method of claim 24 wherein the pre-calculated calibration plane is defined by measuring a calibration pattern.

29. *(Original)* The three dimensional inspection method of claim 24 wherein the second optical element comprises a mirror.

30. *(Original)* The three dimensional inspection method of claim 24 wherein the second optical element comprises a prism.

31. *(Currently Amended)* The three dimensional inspection

method of claim 24 wherein the ~~step of~~ illuminating comprises ~~the step of~~ illuminating with a ring light.

32. *(Currently Amended)* The three dimensional inspection method of claim 24 wherein the ~~step of~~ illuminating comprises ~~the step of~~ illuminating with a plurality of light emitting diodes.

33. *(Currently Amended)* The three dimensional inspection method of claim 24 wherein the ~~step of~~ illuminating comprises ~~the step of~~ illuminating with reflected light.

34. *(Original)* The three dimensional inspection method of claim 24 wherein the sensor comprises a charged coupled device array.

35. *(Original)* The three dimensional inspection method of claim 24 wherein the sensor comprises a complementary metal oxide semiconductor device array.

Claim 36 *(Canceled)*

37. *(Currently Amended)* The three dimensional inspection method of claim 24 wherein the ball grid array devices comprise bump on wafer devices.

38. *(Currently Amended)* The three dimensional inspection method of claim 24 wherein the processing ~~step further~~ includes

~~the step of~~ applying grayscale edge detection to locate ball positions.

39. *(Currently Amended)* The three dimensional inspection method of claim 24 wherein the processing ~~step further~~ includes ~~the step of~~ applying threshold analysis.

40. *(Original)* The three dimensional inspection method of claim 24 wherein the first optical element comprises a lens.

41. *(Original)* The three dimensional inspection method of claim 24 wherein the first optical element comprises a pin-hole lens.

42. *(Original)* The three dimensional inspection method of claim 24 wherein the first optical element comprises a plurality of lens elements.

43. *(Original)* The three dimensional inspection method of claim 24 wherein the first optical element comprises a telecentric lens.

Claim 44 *(Canceled)*

45. *(Original)* The three dimensional inspection method of claim 24 wherein the sensor includes a solid state sensor array.

46. *(Currently Amended)* The three dimensional inspection method of claim 24 wherein the ~~step of~~ processing is carried out on a personal computer.

47. *(Original)* The three dimensional inspection method of claim 24 wherein the second optical element reflects a view to the sensor where at least one ball of the ball array device exhibits a crescent shape.

48. *(Currently Amended)* A three dimensional inspection method for ball grid array devices having a plurality of balls, the method ~~comprising the steps of:~~ comprising:

~~a)~~ illuminating a ball grid array device using a fixed illumination system;

~~b)~~ disposing a single sensor to receive light at a first angle relative to the ball grid array device, wherein the sensor includes a solid state sensor array;

~~c)~~ disposing a first optical element to transmit light to the sensor, where the sensor obtains a first view of the ball grid array device;

~~d)~~ disposing a second optical element to receive light at a second angle different from the first angle, and to transfer a second view of the ball grid array device to the sensor;

~~e)~~ transmitting image information representing the first

view and the second view; and

~~f)~~ processing the image information by applying triangulation calculations to measurements of the image information so as to calculate a three dimensional position of at least one ball with reference to a precalculated calibration plane, wherein the calibration plane comprises a coordinate system having X, Y and Z axes, and wherein an X measurement value is proportional to a Z measurement value.

49. *(Original)* The three dimensional inspection method of claim 48 wherein an XY measurement value is proportional to a Z measurement value.

50. *(Original)* The three dimensional inspection method of claim 48 wherein a Y measurement value is proportional to a Z measurement value.

51. *(Original)* The three dimensional inspection method of claim 48 wherein the pre-calculated calibration plane is defined by measuring a calibration pattern.

52. *(Currently Amended)* The three dimensional inspection method of claim 48 wherein the processing ~~step further includes the step of~~ comprises applying grayscale edge detection to locate ball positions.

53. *(Currently Amended)* The three dimensional inspection method of claim 48 wherein the processing ~~step further~~ includes ~~the step of~~ applying threshold analysis.

54. *(Currently Amended)* The three dimensional inspection method of claim 48 wherein the ~~step of~~ illuminating comprises ~~the step of~~ illuminating with a plurality of light emitting diodes.

55. *(Currently Amended)* The three dimensional inspection method of claim 48 wherein ~~step of~~ illuminating comprises ~~the step of~~ illuminating with reflected light.

Claim 56 *(Canceled)*

57. *(Currently Amended)* The three dimensional inspection method of claim 48 wherein the ball grid array devices comprise bump on wafer devices.

58. *(Original)* The three dimensional inspection method of claim 48 wherein the solid state sensor array includes a charged coupled device array.

59. *(Original)* The three dimensional inspection method of claim 48 wherein the solid state sensor array includes a complementary metal oxide semiconductor array.

60. *(Original)* The three dimensional inspection method of

claim 48 wherein the second optical element comprises a mirror.

61. *(Original)* The three dimensional inspection method of claim 48 wherein the second optical element comprises a prism.

62. *(Original)* The three dimensional inspection method of claim 48 wherein the second view comprises a segment having a crescent shape.

63. *(Currently Amended)* The three dimensional inspection method of claim 48 wherein the image ~~acquisition method comprises~~ information representing the first view and the second view is acquired using a frame grabber.

64. *(Currently Amended)* The three dimensional inspection method of claim 48 wherein ~~the step of~~ processing the ~~output~~ image information is carried out on a personal computer.

65. *(Original)* The three dimensional inspection method of claim 48 wherein the first optical element comprises a lens.

66. *(Original)* The three dimensional inspection method of claim 48 wherein the first optical element comprises a pin-hole lens.

67. *(Original)* The three dimensional inspection method of claim 48 wherein the first optical element comprises a plurality

of lens elements.

68. *(Original)* The three dimensional inspection method of claim 48 wherein the first optical element comprises a telecentric lens.

69. *(Currently Amended)* A three dimensional inspection method for ball grid array devices having a plurality of balls, the method ~~comprising the steps of:~~ comprising:

~~a)~~ measuring a calibration plate to determine a calibration plane;

~~b)~~ illuminating a ball grid array device using a fixed illumination system;

~~c)~~ disposing a single sensor to receive light at a first angle relative to the ball grid array device, wherein the sensor includes a solid state sensor array;

~~d)~~ disposing a first optical element to transmit light to the sensor, where the sensor obtains a first view of the ball grid array device;

~~e)~~ disposing a second optical element to receive light at a second angle different from the first angle, and to transfer a second view of the ball grid array device to the sensor;

~~f)~~ transmitting image information representing the first view and the second view; and

~~g)~~ processing the image information by applying triangulation calculations to measurements of the image information so as to calculate a three dimensional position of at least one ball with reference to the calibration plane, wherein the calibration plane comprises a coordinate system having X, Y and Z axes, and wherein an X measurement value is proportional to a Z measurement value.

70. *(Currently Amended)* A three dimensional inspection process for ball grid array devices having a plurality of balls, wherein the ball grid array device is positioned in a fixed optical system, the process ~~comprising the steps of:~~ comprising:

~~a)~~ illuminating the ball grid array device using a fixed illumination system;

~~b)~~ taking a first image of the ball grid array device with a single camera disposed in a fixed focus position relative to the ball grid array device to obtain a circular doughnut shape image from at least one ball;

~~c)~~ taking a second image of the ball grid array device with an optical element disposed in a fixed focus position relative to the ball grid array device to transmit a side view image of the at least one ball to the camera; and

~~d)~~ processing the first image and the second image using a triangulation method to calculate a three dimensional position of

the at least one ball with reference to a pre-calculated calibration plane.

71. *(Original)* The three dimensional inspection process of claim 70 wherein the second image comprises a segment having a crescent shape.

72. *(Original)* The three dimensional inspection process of claim 70 wherein the calibration plane comprises a coordinate system having X, Y and Z axes and wherein an X measurement value is proportional to a Z measurement value.

73. *(Original)* The three dimensional inspection process of claim 70 wherein the triangulation method to calculate a three dimensional position of the at least one ball is based on determining a center of the ball in the first image and determining a ball top location in the second image.

74. *(Currently Amended)* The three dimensional inspection process of claim 70 wherein the pre-calculated calibration plane is defined through ~~the step of~~ measuring a calibration pattern.

75. *(Original)* The three dimensional inspection process of claim 70 wherein the optical element comprises a mirror.

76. *(Original)* The three dimensional inspection process of

claim 70 wherein the second image is obtained at a low angle of view.

77. *(Original)* The three dimensional inspection process of claim 70 wherein the camera and the optical element are fixed at different angles relative to the calibration plane.

78. *(Original)* The three dimensional inspection process of claim 70 wherein the camera comprises a charged coupled device array.

79. *(Currently Amended)* The three dimensional inspection process of claim 70 wherein ~~the step of~~ processing the first image and the second image ~~further~~ comprises employing grayscale edge detection to locate ball positions.

80. *(Currently Amended)* The three dimensional inspection process of claim 70 wherein ~~the step of~~ illuminating the ball grid array device ~~further comprises employing~~ employs diffuse illumination.

Claim 81 *(Canceled)*

82. *(Currently Amended)* The three dimensional inspection process of claim 70 wherein the ball grid array devices comprise bump on wafer devices.

83. *(Currently Amended)* The three dimensional inspection process of claim 70 wherein the triangulation method uses state values derived from the ball grid array device.

84. *(Currently Amended)* The three dimensional inspection ~~process~~ method of claim 1 wherein the triangulation method uses state values derived from the ball grid array device.

85. *(Currently Amended)* The three dimensional inspection ~~process~~ method of claim 24 wherein the triangulation calculations use state values derived from the ball grid array device.

86. *(Currently Amended)* The three dimensional inspection ~~process~~ method of claim 48 wherein the triangulation calculations use state values derived from the ball grid array device.

87. *(Currently Amended)* The three dimensional inspection ~~method~~ process of claim 70 wherein the processing ~~step further~~ includes ~~the step of~~ applying threshold analysis.

88. *(Currently Amended)* The three dimensional inspection ~~method~~ process of claim 70 wherein the sensor comprises a charged coupled device array.

89. *(New)* The three dimensional inspection method of claim 1, wherein the at least one ball on the ball grid array device

being inspected comprises a contact.

90. *(New)* The three dimensional inspection method of claim 1, wherein the at least one ball on the ball grid array device being inspected comprises a pin.

91. *(New)* The three dimensional inspection method of claim 1, wherein the at least one ball on the ball grid array device being inspected is selected from the group consisting of: bump contact, ball contact, pad, and pedestal.

92. *(New)* The three dimensional inspection method of claim 1, wherein the two different views of the at least one ball are obtained in a single image.

93. *(New)* The three dimensional inspection method of claim 1, wherein the two different views of the at least one ball are each obtained in a separate image.

94. *(New)* The three dimensional inspection method of claim 24, wherein the at least one ball on the ball grid array device being inspected comprises a contact.

95. *(New)* The three dimensional inspection method of claim 24, wherein the at least one ball on the ball grid array device being inspected comprises a pin.

96. *(New)* The three dimensional inspection method of claim 24, wherein the at least one ball on the ball grid array device being inspected is selected from the group consisting of: bump contact, ball contact, pad, and pedestal.

97. *(New)* The three dimensional inspection method of claim 24, wherein the first and second views of the at least one ball are obtained in a single image.

98. *(New)* The three dimensional inspection method of claim 24, wherein the first and second views of the at least one ball are each obtained in a separate image.

99. *(New)* The three dimensional inspection method of claim 32, wherein at least two of the plurality of light emitting diodes are spectrally diverse from one another.

100. *(New)* The three dimensional inspection method of claim 48, wherein the at least one ball on the ball grid array device being inspected comprises a contact.

101. *(New)* The three dimensional inspection method of claim 48, wherein the at least one ball on the ball grid array device being inspected comprises a pin.

102. *(New)* The three dimensional inspection method of claim

48, wherein the at least one ball on the ball grid array device being inspected is selected from the group consisting of: bump contact, ball contact, pad, and pedestal.

103. *(New)* The three dimensional inspection method of claim 48, wherein the image information representing the first view and the second view comprise a single image.

104. *(New)* The three dimensional inspection method of claim 48, wherein the image information representing the first view and the second view each comprise a separate image.

105. *(New)* The three dimensional inspection method of claim 54, wherein at least two of the plurality of light emitting diodes are spectrally diverse from one another.

106. *(New)* The three dimensional inspection process of claim 70, wherein the at least one ball on the ball grid array device being inspected comprises a contact.

107. *(New)* The three dimensional inspection process of claim 70, wherein the at least one ball on the ball grid array device being inspected comprises a pin.

108. *(New)* The three dimensional inspection process of claim 70, wherein the at least one ball on the ball grid array

device being inspected is selected from the group consisting of: bump contact, ball contact, pad, and pedestal.

109. *(New)* The three dimensional inspection process of claim 70, wherein the circular doughnut shape image and the side view image comprise a single image.

110. *(New)* The three dimensional inspection process of claim 70, wherein the circular doughnut shape image and the side view image each comprise a separate image.